AMENDMENTS TO THE CLAIMS

Please amend the claims as shown below.

Claim 1. (Eight times amended) A mutant prenyl diphosphate synthase having [a modified] an amino acid sequence modified from the amino acid sequence[,] of SEQ ID NO:1 by only:

replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81;

replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81;

replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81;

replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81; or

replacing phenylalanine with tyrosine at position 77, replacing threonine with serine at position 78, replacing valine with isoleucine at position 80, replacing isoleucine with leucine at position 84 and inserting proline and serine sequentially between position 84 and position 85

[wherein

said mutant prenyl diphosphate synthase comprises an aspartic acid-rich domain having the sequence, $D_1D_2X_1X_2(X_3X_4)D_3$, in region II of said mutant prenyl diphosphate synthase

wherein each of D_1, D_2, and D_3 denote an aspartic acid residue; X_1, X_2 , X_3, and X_4 are each independently any amino acid and X_3 and X_4 are each optionally independently present in the aspartic acid rich domain,

and wherein said mutant prenyl diphosphate synthase comprises (1) at least one amino acid substitution, said at least one amino acid substitution located at at least one amino acid position selected from (a) an amino acid between D_1 and the amino acid residue at the fifth position upstream of D_1 and (b) the amino acid residue located one amino acid position upstream of D_3; (2) at least one additional amino acid inserted between D_3 and the first amino acid upstream of D_3; or a combination of (2) (1) and (3) (2);

wherein said mutant prenyl diphosphate synthase synthesizes prenyl diphosphate which is shorter than prenyl diphosphate synthesized by a corresponding wild-type enzyme].

Cancel claim 2.

Claim 3. (Two Times Amended) A mutant [enzyme] prenyl diphosphate synthase according to claim 1 wherein [the] a reaction product of the mutant prenyl diphosphate synthase is farnesyl diphosphate.

Claim 4. (Two Times Amended) A mutant [enzyme] prenyl diphosphate synthase according to claim 1 wherein the mutant prenyl diphosphate synthase is [of the homodimer-type] a homodimer.

Cancel claim 5.

Claim 6. (Three Times Amended) A mutant [enzyme] prenyl diphosphate synthase according to claim 1 wherein the mutant prenyl diphosphate synthase is [derived from] a mutant of a *Sulfolobus acidocaldarius* prenyl diphosphate synthase.

Claim 7. (Three Times Amended) A mutant [enzyme] prenyl diphosphate synthase according to claim 1 wherein the mutant prenyl diphosphate synthase is [a] more thermostable [enzyme] than the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius* as determined by the following process: exposing the mutant prenyl disphosphate synthase or wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius* to a temperature of 60 °C or 80 °C for one hour; incubating 200 µl of a reaction mixture at 55 °C for 15 minutes, wherein the reaction mixture comprises the mutant prenyl diphosphate synthase or wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius*, water, 25 nmol/200 µl isopentenyl diphosphate, 25 nmol/200 µl geranyl diphosphate, 10 mM potassium phosphate buffer (pH 5.8) and 5 mM $MgCl_2$ to obtain farnesyl diphosphate and/or geranylgeranyl diphosphate; determining the total amount of farnesyl diphosphate and/or geranylgeranyl diphosphate obtained; comparing the total amount obtained after the 80 °C exposure with the total amount obtained after the 60 °C exposure using the mutant prenyl diphosphate synthase to determine the thermostability of the mutant prenyl diphosphate synthase at 80 °C versus 60 °C; comparing the total amount obtained after the 80 °C exposure with the total amount obtained after the 60 °C exposure using the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius* to determine the thermostability of the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius* at 80 °C versus 60 °C; and comparing the thermostability

of the mutant prenyl diphosphate synthase and the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius*.

Cancel claims 8-10.

Claim 11. (Amended) A DNA encoding [an enzyme] the mutant prenyl diphosphate synthase according to claim 1.

Claim 12. (Amended) An RNA transcribed from [a] the DNA according to claim 11.

Claim 13. (Amended) A recombinant vector comprising [a] the DNA according to claim 11.

Claim 14. (Amended) [A] An isolated host organism transformed with [a] the recombinant vector according to claim 13.

Claim 15. (Three Times Amended) A process for producing a mutant [enzyme] prenyl diphosphate synthase according to claim 1, said method comprising the steps of culturing a host transformed with an expression vector comprising a DNA [coding for] encoding the mutant [enzyme] prenyl diphosphate synthase and [of] harvesting the [expression product] mutant prenyl diphosphate synthase according to claim 1 from the culture, wherein the mutant prenyl diphosphate synthase is produced by expression of the expression vector.

Claim 16. (Three Times Amended) A process for producing a prenyl diphosphate having not more than 15 carbons comprising the step of bringing [an enzyme] the mutant prenyl diphosphate synthase according to [claim] any one of claims 1 [or any of claims 2] to 4, 6 and 7 [10] or [an enzyme] the mutant prenyl diphosphate synthase produced by the method according to claim 15 into contact with a substrate selected from the group consisting of isopentenyl diphosphate, dimethylallyl diphosphate, and geranyl diphosphate.

Cancel claims 17-48.

Claim 49. The mutant prenyl diphosphate synthase of claim 1, wherein the amino acid sequence of SEQ ID NO:1 is modified by only replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81.

Claim 50. The mutant prenyl diphosphate synthase of claim 1, wherein the amino acid sequence of SEQ ID NO:1 is modified by only replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81.

Claim 51. The mutant prenyl diphosphate synthase of claim 1, wherein the amino acid sequence of SEQ ID NO:1 is modified by only replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with leucine at position 81.

Claim 52. The mutant prenyl diphosphate synthase of claim 1, wherein the amino acid sequence of SEQ ID NO:1 is modified by only replacing phenylalanine with tyrosine at position 77, replacing threonine with phenylalanine at position 78 and replacing histidine with alanine at position 81.

Claim 53. The mutant prenyl diphosphate synthase of claim 1, wherein the amino acid sequence of SEQ ID NO:1 is modified by only replacing phenylalanine with tyrosine at position 77, replacing threonine with serine at position 78, replacing valine with isoleucine at position 80, replacing isoleucine with leucine at position 84 and inserting proline and serine sequentially between position 84 and position 85.

Claim 64. The mutant prenyl diphosphate synthase of claim 1 synthesizing more farnesyl diphosphate than the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius* as determined by the following process: incubating 200 μl of a reaction mixture at 55 °C for 15 minutes, wherein the reaction mixture comprises the mutant prenyl diphosphate synthase of claim 1 or wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius*, water, 25 nmol/200 μl isopentenyl diphosphate, 25 nmol/200 μl geranyl diphosphate, 10 mM potassium phosphate buffer (pH 5.8) and 5 mM $MgCl_2$ to obtain farnesyl diphosphate; determining the amount of farnesyl diphosphate; and comparing the amount of farnesyl diphosphate obtained using the mutant prenyl diphosphate synthase of claim1 with the amount of farnesyl diphosphate obtained using the wild-type geranylgeranyl diphosphate synthase of *Sulfolobus acidocaldarius*.